The Alberta Agriculture Research Trust 1986-1987

Annual Report

91-01406/

The Alberta Agricultural Research Trust 1986-1987

Agricultural research is the keystone of our co-ordinated efforts to ensure the long-term viability and profitability of Alberta's farm economy. It is, therefore, essential that we maximize the dividends of this most important investment.

In 1986/87, the Alberta Agricultural Research Trust (AART) funded 40 projects (17 renewals and 23 new) for a total of $520,235.67. Significantly, more than 42% of this funding came from private industry. Its contribution is greatly appreciated. It is hoped that the private sector will increase its participation in future research efforts, as technology development is crucial to the continued strength of the industry.

Over the last 20 years, the AART has supported a total of 437 projects with $8,125,142.02 million in funding. This has built a good foundation for Alberta's future agricultural research efforts.

The Alberta Agricultural Research Institute has appeared on the agricultural research horizon. The proposed Institute will incorporate and broaden the functions of the AART. The Institute's objectives are to set research policy, determine priorities, provide overall co-ordination, and support long-term projects in co-operation with industry, universities and other agencies. Building on the experience gained under AART, the Institute will consolidate the hard-won advances in agricultural research.

On behalf of the Board of Trustees of the Alberta Agricultural Research Trust, I extend our appreciation to the participating researchers, to the Grants Committee and to those organizations and businesses which continue to support agricultural research in Alberta.

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ANIMAL SCIENCE

AHERNE, F.X., J.J. BRENNAN

Effect of floor type on the severity of foot lesions and osteochondrosis in pigs

Sixty-seven pigs were weaned at five weeks of age and assigned to pens with plastic coated expanded metal or woven wire flooring. The feet of each pig were examined at weaning and at the end of the 28 day test period for soundness. Eleven gilts which had been on plastic coated flooring and 12 gilts which had been on woven wire flooring were moved to 1.2 x 1.2 m pens with the initial floor types. These pigs were fed ad libitum until slaughter at 94 kg liveweight. Limb bones and feet were removed and examined for lesions. At weaning the incidence of foot lesions was only 7%. Floor type did not have any significant effect on average daily gain, average daily feed intake or feed/gain of pigs during the starter (8 to 23 kg), grower (22 to 55 kg) or finisher (55 to 94 kg) periods. Foot lesions were most severe ($P<0.01$) in starter pigs which were penned on woven wire flooring. There was also a tendency ($P<0.06$) towards more severe foot lesions in market-weight gilts housed on woven wire flooring. The outer digits of the feet of these gilts had more severe lesions ($P<0.01$) than had the inner digits. Cartilage soundness scores for the condyles of the femur and humerus, the articular cartilage of the proximal ulna and radius and the distal epiphyseal plate of the ulna were not significantly ($P>0.05$) affected by floor types. The influence of floor type on the locomotory system appears therefore to be confined to local foot abrasions and does not appear to extend to the knee and elbow joints.

Industry support for this project was provided by the Alberta Pork Producers Marketing Board.

AHERNE, F.X., H. SPICER

An evaluation of the nutritive value of hulless barley for young pigs

A feeding and digestibility trial was conducted to evaluate the nutritive value of two hulless barley cultivars (Black and Scout) compared with regular barley for starter pigs. The second objective was to determine if the addition of Zymobest to one of the hulless barley cultivar diets would improve pig performance. Thirty-six four week old crossbred pigs were allotted to four dietary treatments. The diets were formulated to be isonitrogenous (20% protein) and isoenergetic (3300 kcal DE/kg). Digestibility of gross energy, protein and dry matter were determined using dysprosium chloride. There were no differences ($P>0.05$) in average daily gain for pigs fed the four diets. Likewise feed intakes and efficiency of feed conversion revealed no treatment differences. Digestibility coefficients for energy, protein and dry matter were similar for diets supplemented with hulless barley or those containing 40% wheat and 20% hooded barley. The addition of a glucanese (Zymobest) had no significant effect on pig performance or diet digestibility. It was concluded that hulless barley can be used to replace a wheat-barley combination in starter pig diets without reducing pig performance.

Industry support for this project was provided by Western Hog Growers.

AHERNE, F.X., R.N. KIRKWOOD, F. EVANS

A study of growth and physiological development in gilts

Thirty-six Yorkshire x Landrace gilts were selected at 74 days and 32 kg body weight and assigned to one of six treatments. Treatments involved feeding gilts to achieve a weight of 90 kg at either 175 or 195 days, or to achieve a weight of 70 kg at 175 days. Further groups of gilts were fed to achieve the same weights (70 or 90 kg) 20 days earlier than those above. From that time a severe feed restriction was imposed to achieve a zero net weight change for 20 days until they achieved the required age. At the achievement of their age-weight end point each gilt was blood sampled at 2 hour intervals for 24 hours (2400 to 2200 hours) and the plasma levels of growth hormone and cortisol determined. Additionally, during a 4 hour period (0800 to 1200 hours) all gilts were sampled at 15 minute intervals, these samples being assayed for luteinizing hormone levels. Following the above sampling all gilts received an intramuscular injection of estradiol benzoate at 15 g/kg body weight. At the time of injection and at 6 hours intervals for 72 hours, further blood samples were taken and assayed for luteinizing hormone content. No treatment effects were noted on the plasma profiles of cortisol, luteinizing hormone or growth hormone. Plasma concentrations of cortisol tended to decrease with increasing age or weight, but these differences were not significant. Peaks of plasma growth hormones were noted in early morning and late afternoon, but rarely between 0400 and 1600 hours. Plasma luteinizing hormone levels were uniformly decreased within 6 hours of estradiol benzoate injection ($P<0.01$). There was no effect of treatment on the luteinizing hormone response to estradiol benzoate injection, although two patterns of luteinizing hormone release were observed, involving either a single or a double peak of luteinizing hormone.

Industry support for this project was provided for by the Alberta Pork Producers Marketing Board.

BERG, R.T.

Influence of selection for growth on maternal traits in mice

Laboratory mammals such as mice are useful in studying the long term effects of selection on production traits. Experiments were carried out in the Department of Animal Science to determine the effects of long term selection for high and low growth on maternal traits in mice. The experiments were further extended to accommodate the effects of two environments, cold and control and two mating systems, inbreeding and outbreeding. Long term selection increased body weight, feed intake and growth efficiency in the high body weight lines. The results also showed that at birth, litter weight and mortality were influenced strongly by both mating system and environment. Purebred lines had lower litter weights and higher mortality in the cold environment compared to the outbred lines suggesting a wider range in adaptability among outbreds. Furthermore, litters from heavier females were heavier at birth and survived better in the cold environment. Litter weight at weaning was affected by sire, dam, sex of offspring and the environment. Mortality was affected by all factors other than sex of offspring. Outbred progeny were 8% heavier at weaning compared to purebreds in the cold environment and 2% heavier in the warm environment.

BERG, R.T., M.A. PRICE, R.T. HARDIN

Strategies for beef cattle improvement

The data for all studies were obtained from the beef lines (Hereford, Beef Synthetic and Dairy Synthetic) at Kinsella, Alberta belonging to the University of Alberta and from the Beef Booster Cattle, Cochrane, Alberta. Several related and complementary studies were carried out to identify the strategies for beef cattle improvement in Alberta. Dystocia was identified as a factor reducing beef productivity and the cow's weight at calving recognized as a single most important factor affecting the incidence of dystocia followed by calf birth weight, especially in heifers. The use of low birthweight bulls was important in reducing dystocia in heifers. Heavier cows depleted more of their fat stores to maintain a constant body weight over winter. Furthermore, heavier cows had the lowest maintenance requirements per unit liveweight. Winter adaptiveness did not seem to be the primary reason for differences in productivity between the breed types in the Kinsella herds. The Herefords, because of their longer selection histories for cold adaptedness, appeared to be in better condition in mid-winter. Selection was more effective in changing postweaning gains in the Synthetic population, compared with the Herefords. Accuracy of the preweaning traits was improved when they were adjusted initially for sex of calf followed by age of dam within each sex. Inclusion of Holstein and Brown Swiss in beef lines increased milk production by 28% compared to Herefords and thereby improved cow productivity. Ultrasonic backfat measurements taken several weeks prior to slaughter were recognized as useful in predicting actual carcass fat.

Industry support for this project was provided by Beefbooster Ltd.

BERG, R.T., Z. HAWRYSH, M.A. PRICE

Assessment of optimum slaughter weight and condition in beef cattle

Two experiments were conducted in which a group of live cattle judges of different experience and background were asked to judge cattle with and without the provision of ultrasonic data. The cattle were slaughtered immediately after being judged, and actual carcass data were compared with the judges' scores.

The results, unfortunately, were inconclusive and not considered publishable, although the study provided an important stimulus to the publication of an article reviewing live cattle appraisal (Price, 1980). The grant did, however, supplement a number of subsequently published studies and a large amount of work on fat accumulation and distribution.

KENNELLY, J.J., M.K. SONG, P.H. ROBINSON

Use of ammonia in the preservation and improvement of the nutritive value of barley silage

Two experiments were conducted to estimate effects of ammoniation of barley silage on silo fermentation, ruminal degradability, and milk yield and composition (Experiment 1), and to determine effects of ammoniation on digestion and utilization of barley silage (Experiment 2).

Chopped whole plant barley was ensiled with and without addition of anhydrous ammonia at the time of storage. Three 15% crude protein diets were formulated with either canola meal or urea added to non-ammoniated barley silage at a level equivalent to the crude protein added by ammoniation of barley silage. In Experiment 1 twenty-seven cows in mid-lactation were fed a mixed diet containing 50% silage and 50% concentrate (dry matter basis) ad libitum for six weeks. In Experiment 2 three cows in mid-lactation fitted with permanent rumen and duodenal cannulae were fed the same diets as in the feeding trial (Experiment 1) by automatic feeders 12 times a day.

Ammonia treatment of chopped barley silage at ensiling increased crude protein, pH, NH_3-N and lactate concentration in silage. Milk yield, milk fat, and serum urea-N content were not affected by ammoniation of barley silage. Higher concentrations of ammonia and propionic acid, and a lower ratio of acetic to propionic acid in rumen fluid were observed for cows fed ammoniated barley silage compared with those fed non-ammoniated barley silage. Total crude protein supply to the small intestine and fractional ammonia nitrogen (NH_3-N) and non-NH_3-N were increased by ammoniation of barley silage. Rumen degradability and digestibility of total diet of dry matter and crude protein were not affected by supplemental protein sources.

Ammoniated barley silage was equal in feeding value to untreated silage isonitrogenously supplemented with either canola meal or urea. This offers practical economic advantage to producers.

Industry support for this project was provided by Esso Resources Canada Ltd.

KENNELLY, J.J., P.H. ROBINSON, G. de BOER

The mobile nylon bag as a rapid reliable indicator of heat damage in dehydrated alfalfa

The objective of this research is to determine if the mobile nylon bag procedure can be used as a reliable indicator of the nutritional value of dehydrated alfalfa. Results of the preliminary study suggested that heating temperature per se during drying of alfalfa, in the 235°C to 255°C range, had no discernible impact on rumen digestion of dry matter or crude protein versus that in frozen alfalfa. However, the heat and steam required for pelletting appears to have reduced rumen digestion of crude protein without affecting digestibility of other components. Results suggested that the time variation in drying alfalfa is a potentially more significant modifier of final product quality than temperature per se. Based upon this finding the main study was designed to examine time of heating at 235°C on quality of dehydrated alfalfa with different levels of crude protein.

Time of heating of dehydrated alfalfa has two major influences on protein quality. It causes soluble proteins to be shifted to the rumen degradable fraction slowing degradation of protein in the rumen overall and enhancing rumen protein escape. This is a positive benefit in ruminant production, particularly for dairy cattle. The other influence is to shift proteins into the rumen, and probably intestinal, undegradable fraction. This enhances rumen protein escape but the influence is negative overall as this heat damaged protein is largely indigestible in the intestine. Results of this study suggest that the beneficial influence of heating is greater than the negative influence with 4 minutes of heating at 235°C but that after 4 minutes protein quality declines rapidly due to the rapid increase in heat damaged protein. Clearly this is reflected by the rapid increase in lignification which results in reduced digestion of cellulose and hemicellulose.

Rumen nylon bag incubation results are in general agreement with fibre and protein analyses of alfalfa; both suggesting potential net improvement of digestibility characteristic of alfalfa dry matter and crude protein with 4 minutes heating but rapid deterioration thereafter. These suggestions are confirmed by post-ruminal digestion results which show only a moderate depression in whole tract dry matter and crude protein digestion with 4 minutes heating but severe depression with 8 minutes.

FOOD SCIENCE

LE MAGUER, M.

Binding site accessibility of immobilized molecules to large molecules

A new volumetric technique was developed and shown to have good accuracy and precision to determine water adsorption isotherms on biological materials. The volumetric technique is particularly well suited for studies at the low water activity range (0 to 0.5) for temperatures between 0°C and 60°C and for low moisture capacity products with water adsorption of less than 0.001 g of water per gram of dry material.

This technique was used to characterize the surface of biological materials and their active sites. It was possible to measure the changes that take place during the manufacturing of these biologically active molecules (immuno adsorbents). In particular the active sites are grouped in patches occupying only 70% of the possible surface. The levels of water adsorption (30 to 70 micromoles of water per gram of dry support) would have been impossible to measure by any other techniques and confirms the usefulness of the volumetric measurements. Valuable information was obtained leading to changes in the manufacturing process.

At the same time measurements were conducted at various temperatures in the low range of water activity to determine the strength of the binding of water molecules to the substrates. The values obtained (581 kJ/kg of water) are in line with the binding of water on starch and prove again that the technique is very reliable and unique in its ability to measure precisely in extremely low surface coverages to obtain critical parameters. The surface area and binding strength information obtained are extremely useful informations for the identification of the preferred adsorption sites on the immobilized molecules.

OORAIKUL, B.

Food sauce from canola meal

Three types of microorganisms, *Pediococcus halophilus, Saccharomyces rouxii* and *Torulopsis versatilis* were "trained" to grow in media containing 18% w/v NaCl so that they could be used in the moromi fermentation of canola sauce. After a prolonged lag phase of growth the normal lag phase was restored in subsequent transfers and the microorganisms reached the desired cell count of 10^7-10^8 CFU/ml before being inoculated into a moromi. In the moromi fermentation which lasted 31 days, a stepwise inoculation beginning with *P. Halophilus* followed by *S. rouxii* and *T. versatilis* after 4 days, produced a canola sauce with sensory and chemical qualities closest to Kikkoman shoyu. The sauce had the pH of 4.6, contained 34.0% total soluble solids, 1.38% total soluble nitrogen, 0.47% amino nitrogen, 1.6% ethanol and 1.77% lactic acid as compared to 4.7, 36.3%, 1.52%, 1.62% and 0.53%, respectively, in Kikkoman shoyu. The amounts of inocula and time of fermentation may need further adjustment to balance the quantities of these components to produce an even better sauce.

Industry support for this project was provided by I & S Produce and Alberta Food Products.

SPORNS, P.

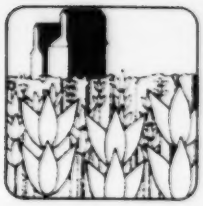
Monoclonal ELISA analysis of total potato glycoalkaloids

The objective of this project was to begin development of a simple test for potato glycoalkaloids using immunological techniques. Potato glycoalkaloids (sugar-linked alkaloids) are about as toxic to man as Strychnine (About 5 mg/kg lethal dose) and can be found at levels up to 200 parts per million or more in potato tubers. The eventual goal of this initial study was to develop a simple and inexpensive commercially available test that would be based on monoclonal antibody recognition of the main toxic potato alkaloid, Solanidine.

The initial phase of development of this test has been completed. A method of chemically linking Solanidine to proteins for immunization of mice and for the final enzyme-linked immunosorbent assay (ELISA) was developed. This method involved formation of-Chaconine from-Chaconine (a natural potato glycoalkaloid containing the alkaloid Solanidine) by selective hydrolysis and then reductive condensation of sugar aldehydes formed from-Chaconine with the amino groups of the requisite protein. A method to quantitate the amount of alkaloid bonded per protein molecule was also developed and this method was used to evaluate the success and amount of the alkaloid protein bonding.

The protocol required for the production of monoclonal antibodies was also explored. An injection scheme for the Balb/c mice; a method to estimate the immune response of the mice; fusion of mouse spleen cells with myeloma cells (SP 2/0 Ag 14); and methods of determining the production of the required antibodies from resulting hybridomas were all evaluated. Further development work on this monoclonal ELISA test for potato glycoalkaloids continues with the support of the company, Chembiomed.

Industry support for this project was provided by Chembiomed.



PLANT SCIENCE

KNOWLES, R.H.

The behaviour of turfgrass growing on minimal medium in response to irrigation and nutritional inputs

This project was started in 1980 to evaluate the effect of cultural impacts on the performance of cultivars of Kentucky Bluegrass, the Fine Fescues and Creeping Bentgrass. All grasses were established in the field on soil modified to depth of 20 cm with 50% jet sand.

In addition to the management experiment a cultivar trial was also maintained for the benefit of the supporting industry to evaluate turf quality and survivability of selected Perennial Ryegrass cultivars, turf type Tall Fescues, Creeping Timothies and other miscellaneous grasses.

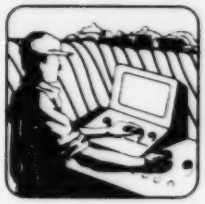
Plots that were managed at customary maintenance levels, but on the modified medium, were easily stressed making it possible to pick out inherent differences in cultivars, something that is not always easy when turfgrasses are given more optimal growing conditions. Stressing in this way also made it possible to make judgements more readily as to time of autumn maturity and spring green-up, two important factors in the selection of turfgrasses for all purposes.

In the management trial, Kentucky Bluegrass showed its need for higher levels of nitrogen and regular mowing in order to maintain optimal performance. The Fine Fescues were not as dependent on nutrient inputs but required regular mowing at a height of 4 cm to maintain good density.

The Creeping Bentgrasses being used in the experiment were severely damaged in the winter of 1981 by the snow mold organism and were totally replaced in 1982. Surprisingly, the grass that consistently showed the least resistance to the organism was the widely used cultivar Penncross.

The cultivar trials with Perennial Ryegrasses and turf type Tall Fescues demonstrated quite clearly that seedsmen have yet to find the germplasm necessary to produce cultivars that will survive winter conditions at the latitude of Edmonton. Both of these turfgrass types established quickly and well and most cultivars showed excellent turf quality, however, their collective ability to survive the winter was very close to zero. All Creeping Timothy cultivars survived the winters without injury, however none of them displayed any qualities that would allow them to meet North American Standards for turfgrass appearance.

Industry support for this project was provided by the following: Onesco Western Ltd., Big Lake Sod Farm, Gem Sod Farms, Bluegrass Sod Farm, Aimers Seed Ltd., Rothwell Seed Ltd., Otto Pick & Sons Seeds Ltd., Hanna Seeds Ltd., National N-K Seeds Ltd., Lofts Pedigreed Seed, Jacklin Seed Co., Northrup King Seeds, Prairie Seeds, and Pickseed.



RURAL ECONOMY

HAWKINS, M.H.

Transportation of Alberta hogs

The purpose of this research was to study the hog transportation industry in Alberta. Reference in the study is made to both pricing and operational efficiency, each of which impact on market efficiency.

Reference is made to the historical development of trucking regulations as well as the federal and provincial roles in trucking regulation. Also included in this study is a review of the procedures for obtaining an extra-provincial operating authority. It appears that there are problems with the process for the granting of operating authorities. One of the problems that the study has pointed out is the apparent lack of a definition for the term "in the public interest" which is used in public hearings.

A questionnaire was sent to truckers hauling hogs in Alberta to gain information on rates, costs, backhauls, and equipment. The response rate for the questionnaire was low. However, the use of data on rates and destinations supplied by the Alberta Pork Producers Marketing Board enabled the researchers to fulfill and supplement the objectives of the questionnaire. In the study it is shown that trailers tend to be underutilized on backhauls, rates are variable between census divisions and total costs are in many cases unknown by respondents.

This study chose linear programming as the tool to present a situation which minimized transportation costs for hogs marketed in Alberta over a one year period. Results from the model showed that minimized costs were slightly over 7.4 million dollars, which in turn were compared to the costs of actual hog movements. The difference between the modelled results and the actual results was approximately 1 million dollars or 14 percent. Therefore, it would appear that the actual performance of the Alberta Pork Producers Marketing Board, which must minimize costs on a day to day basis, was close to the modelled results.

Presented below are some of the major recommendations from the study. In the case of extra and intra provincial operating authorities it is recommended that the term domestic livestock not be used and in its place specific livestock be listed. For example an authority will specify the type of livestock (hogs) which trucking firms may haul. Hogs, being a primary agricultural good should be exempt from regulations. The nature of the product requires that time for delivery to market be at a minimum. This would be in line with the exemptions for primary agricultural goods in the United States. The recent proposed changes in trucking regulation agreed upon by federal and provincial agencies would shift the burden of proof from the applicant to the respondent for the granting of operating authorities, and is fully supported by this study. This proposed change would make the hearing process more equitable and the incidence of frivolous objections would be greatly reduced.

Industry support for this project was provided by the Alberta Pork Producers Marketing Board.

LEROHL, M.L., M.H. HAWKINS

The Canadian grain grading system and the efficiency of the Vancouver grain terminals

The objectives of the study were to determine and describe the effects of the grading system on terminal elevator operations; to quantify the cost attributed to the grading system, and to determine the effect of handling additional grades on terminal elevator throughout. These goals were pursued through description of the terminal handling process, as well as by examining effects of the Canadian grain grading system on terminal operations and by examining effects of handling additional grains and grades.

Evidence obtained indicate there is a relationship between the grain grading system and the throughput of the terminal elevators at Vancouver. The present system of grading wheat in Canada slows terminal throughput through delays in unloading due to grading, a reduction in cleaning capacity and a reduction in usable storage space. In addition, the cost of operations at the terminals is higher than necessary due to labour requirements necessitated by the present method of grading grain at the terminals. The throughput of the terminals is decreased by additional grains or grades being handled. Estimates presented, based upon grades being the limiting constraint within the system, suggest possible throughput increases of up to 60 percent by deleting 5 grade and protein segregations in wheat.

Industry support for this project was provided by the Alberta Wheat Pool.

VEEMAN, M.M.

Economic evaluation of quota allocation and transfer methods of supply-managed commodities

The study documented the quota allocation and transfer policies and regulations of the provincial supply-management marketing boards for two commodities, fluid milk and broiler chicken. Subsequent analysis of the economic effects of quota transfer policies focussed on broiler chicken. In those provinces where transfer of quota has been tied to the transfer of productive farm assets, or otherwise restricted, quota values were lower but production units tended to be smaller and unit labour costs of production were higher than in those provinces where quota transfers occur through a system of free trade in quotas. Economic efficiency would be enhanced by allowing free trade in quotas.

SOIL SCIENCE

MacHARDY, F.V.

Assessment of nitrogen contribution to cereals by intercropping with annual legumes

The experiment was suspended in 1980 so that the land on which it was carried out (low in available N) could be used for field tests involving inoculating with associative N fixing bacteria, however during the three years the test was in progress, grain yields of barley plus field peas (planted in alternative rows with 6" spacing), always significantly exceeded the yield of barley alone. Total protein content of the harvested grain was also significantly higher.

Mixtures of faba beans and barley, however, did not produce any significant benefits over barley alone in yield or protein content - primarily due to the fact that the faba beans were very immature when the barley reached harvesting maturity.

From the point of view of convenience of operations, seeding presented no problems, except that two seed drills in tandem were required - each with half of its seed runs blocked off. Combining the swaths of barley plus peas required careful management of the pick-up because of the binding effect of the pea vines.

Regarding the prime objective of the experiment - to see whether or not the legume residue contributed significantly to the subsequent levels of soil nitrogen – the three years of tests failed to measurably influence the yield of the following crops. However, when the new experiment was undertaken on the land in which the intercropping experiment had been conducted, with rows planted crosswise to the intercropping experiment, bands of darker green showed up visually in the barley crop. These bands corresponded to the location of the barley plus pea strips. One might then conclude that some subsequent benefit would be expected to accrue from the practice of intercropping peas and barley.

MacHARDY, F.V.

Measurement of photosynthate requirement for nitrogen fixation by selected free-living microorganisms found in Alberta soils

1. A number of nitrogen fixing bacteria were isolated from locations in Alberta and the Northwest Territories. Two species of Nif bacteria in particular appeared in most soil and plant materials collected.
   a. An unidentified *clostridium*. Dr. F. L. Jackson, Department of Medical Microbiology, University of Alberta indicated this sporulating motile nitrogen fixing organism to have percent G+C ratio of 37.5 and to be non-virulent in animals.
   b. Two species of *Azospirillum*, *A. brasilence* and *A. lipoferum* were found to be widely distributed in Alberta and the Northwest Territories. An unpublished paper "The occurrence of Azospirillum in Northwestern Canada" by F. V. MacHardy and F. D. Cook indicating the locations in which 57 strains were isolated.

Subject to the isolation of these wild strains of Azospirillum a Nif_c mutant (fixes nitrogen in the presence of soil ammonia) was developed. The collection of these nitrogen fixing bacteria was described in two published articles F. V. MacHardy 1978 "Free-Living Nitrogen Fixing Bacteria in North Central Alberta Soils" Agriculture and Forestry Bulletin, Vol. 1, No. 1., 1978, University of Alberta, and F. V. MacHardy, 1981 "Genetic Engineering in Biological Nitrogen Fixation" Agriculture and Forestry Bulletin, Vol. 4, No. 2, 1981, The University of Alberta.

2. The results of four years of field inoculations of barley with various nitrogen fixing bacteria cultures is shown in the following table. The barley variety Bonanza was used in the tests. The *A. brasilence* most commonly found in Alberta soils, the Nif_c mutant and the clostridium previously mentioned were the nitrogen fixing bacteria used. The tests were conducted on randomly selected triplicated quarter acre plots. Yields recorded were the weights of threshed grain resulting from combining one 15 foot swath down the centre of each plot. The inoculum was applied as a spray directed into the seed furrow immediately behind the furrow opener. The rate of inoculation was about 5×10^9 cells per meter length of furrow. The seed drill used had 6" furrow spacing.

PLOT YIELDS - INOCULATIONS TRIALS

Year & Field		Check	Medium Alone	A. Bras.	Abras. Nif$_c$	Treatment Clostridium	Mixed
1980	A	411	453*	451*	451*		
	B						
1981	A	191	192	182	184		
	B	251	268	252	256		
1982	A	237	240	226	239	245	229
	B	241	228	286	320*	309*	319*
1983	A	184		222	174		
	B						

*Significantly different than check at the 0.05 probability level.

The results are clearly mixed. My conclusions following these tests are that, although there is some indication that yield is increased, the method of application was not sufficiently refined to guarantee a reasonable survival rate. Also, as has been shown by other researchers, plants should be selected that produce an attractant to encourage colonization of the rhizoplane by nitrogen fixing bacteria. Bononza barley was not investigated for this characteristic.

Samples of *A. brasilence*, the Nif$_c$ mutant of this strain and a pigmented mutant of A. *brasilence* were sent to Dr. P. Wani, Microbiologist at the International Crops Research Institute for the Semi-arid Tropics located in Hyderabad, India. Dr. Wani has been able to show a consistent benefit from inoculating pearl millet with associative nitrogen fixing bacteria equivalent to approximately 20 kg of N per ha. Based upon Dr. Wani's work with associative nitrogen fixing bacteria, including the strains sent from here, inoculation of pearl millet is now a recommended practice in Indian states of the semi-arid tropics.

3. Following the inconclusive field results from 1980 to 1983, a change was made to investigate the possibility that abiological nitrogen fixation was occurring Alberta soils. This followed on the published work of Schrauzer at the University of California, San Diego on abiological fixation of nitrogen in desert soils. This investigation utilizing N_{15} technology with mass spectrometer assay confirmed that abiological nitrogen fixation does take place in Alberta agricultural soils. This research was fully reported in the article, MacHardy, F. V. and C. J. Howard, 1985, "Nitrogen Fixation in Sterile Alberta Soils" Agriculture and Forestry Bulletin, Vol. 8, No. 1, 1985, University of Alberta.

PLUTH, D.J., J.C. HERMANS

Nutrient distribution and cycling in selected forest ecosystems

Aboveground dry matter by vegetation components and nutrient element concentrations in those components were estimated in three lodgepole pine communities of different ages. Soil fertility properties in the Gray Luvisolic soils were measured in the study sites located about 30 km north of Edson, Alberta.

Aboveground dry matter ranged between 120 and 180 tonnes per hectare with the pine trees comprising 88 to 94%. Total amounts of individual nutrient elements were similar in the aboveground biomass among the three communities. Concentrations of most nutrient elements were greatest in needles and least in wood of the main stem with branches, bark and cones intermediate. For the pine tree component only, wood of the main stem and bark contained up to 75% of the potassium, 72% of the calcium, 64% of the magnesium, 72% of the zinc and 67% of the manganese in all aboveground tree components.

Such information on amounts of individual nutrient elements contained within biomass components can be used to determine what effects biomass utilization strategies can have upon site nutrient capital.

Industry support for this project was provided by Imperial Oil Co.

VETERINARY MEDICINE

JANZEN, E.D.

Efficacy of immunization of feedlot calves with a commercial ***Hemophilus somnus*** *bacterin*

To see if a commercial *Hemophilus somnus* bacterin would reduce feedlot calf death to hemophilosis, 5357 calves vaccinated with the bacterin immediately upon arrival and again approximately two weeks later were compared to 5366 calves that were not so vaccinated. All 10,723 of these auction market calves were fed at a 15,000 head capacity commercial feedlot in southwest Alberta in pens which contained an average 300 calves. The *Hemophilus somnus* bacterin significantly reduced calf mortality during the first two months the calves were in the feedlot; this coincided with the time when the risk of a calf developing a fatal disease was highest. The protective effect of the bacterin was more apparent in steer calves than heifer calves; one possible reason for this difference was that a greater proportion of heifer calves became fatally sick during the first week, before the bacterin could have had an effect. The second vaccination did little to reduce calf mortality, possibly because the second vaccination was given after the period of greatest fatal disease. These findings also add credibility to the suggestion that inclusion of a *Hemophilus somnus* bacterin in a cow-calf preimmunization program will reduce subsequent feedlot calf mortality.

Industry support for this project was provided by Boehringer - Ingelheim, and Thiessen Farms.

MURPHY, B.D.

Improving reproduction in mink

The overall goal of the proposed study was to improve mink production by increasing reproductive rates. Evidence suggests that embryo mortality is highest during the period of embryonic diapause. Emphasis was placed on development of a simple and reliable method to induce early embryo implantation. Experiments were carried out with a series of agents that release the pituitary hormone prolactin, and one of these, pimozide, proved most effective. It was then administered to animals in feed for a brief period, resulting in induction of implantation and synchronization of parturition. Embryo survival was greater in some trials, and it is expected that improvement of dose and delivery regimes will result in consistent gains.

The second approach to improvement of mink reproduction consisted of studies to determine the effects of the neurohormone melatonin on embryo implantation and male reproduction. The results demonstrate that melatonin inhibits embryo attachment, and antibodies for passive immunization against this hormone were developed. Preliminary trials using these to abbreviate embryonic diapause were promising. It was concluded from these experiments that melatonin administration will bring about precocious puberty in males and may serve to extend the breeding season in this species.

Industry support for this project was provided by the Canadian Mink Breeders.

NAYLOR, J.M.

Copper supplementation to beef cows during the winter and summer feeding periods

We studied the effects of providing supplementary dietary copper to a herd of beef cows. In the first year of the trial the calves showed clinical signs of copper deficiency and there was a growth response to the subcutaneous injection of copper EDTA.

In the second trial pregnant cows were fed a basal ration of bromegrass silage, barley and minerals over the winter feeding period. The feed was supplemented with copper so that half received 5.5 mb/Kg of copper on a dry matter basis and half 40 mg/Kg. Calving occurred in the spring. There was no evidence of copper deficiency in the calves and there was no difference between the two levels of copper supplementation in calf birth weight, immune function status or susceptibility to scours.

The cows and calves grazed the same copper deficient pasture over the summer. The mean adjusted weaning weights for calves born to supplemented calves was 248.9 Kg which was significantly greater than the 243.1 Kg weight for calves from non-supplemented dams.

Our data indicated that copper determinations do not provide evidence of deficiency till serum levels fall below 9 mol/L and liver values fall below 0.90 mol/g wet matter.

INTERDISCIPLINARY

CLEGG, L.F.L.

Fertilizer and trace element studies

The major objective of this cooperative study was to determine the degree of influence of specific cultural and/or environmental factors on the quality of potatoes for fresh consumption and for processing.

Field variables included levels of irrigations (no irrigation, 50% field capacity, 75% field capacity), levels and time of application of major nutrients, and levels of minor-nutrients. In addition to the treatments at the University's plots in Edmonton, tubers were harvested from minor-nutrient plots at four locations in southern Alberta.

Total protein content of tubers increased with an increase in soil moisture and with an increase in amount of nitrogen applied. Total protein content was not affected by time of application of nitrogen. Levels of boron, iron, maganese and zinc had no influence on post-harvest quality. Specific gravity was not influenced by nitrogen levels up to 500 lbs. per acre but it was slightly decreased by an increase in moisture level. The content of citric and malic acids in tubers decreased as the level of nitrogen fertilizer application increased. The level of phosphoric acid and PCA increased with an increase in nitrogen application. PCA in certain fresh and processed vegetables can result in a bitter off-flavor.

The use of "reconditioning" subsequent to varying lengths of storage is increasing in reference to the chipping process. Lower levels of fertilizer and split applications were associated with somewhat higher chipping scores. French fry quality was slightly better when all the nitrogen was applied in one early application. The reverse was true when considering boiling quality.

Further research relation to the interactions among specific uses of tubers and several of the common cultivars is strongly recommended.

CONTINUING GRANTS

Date following title identifies Annual Report in which project description appears.

ANIMAL SCIENCE

PRICE, M.A.

The use of young boars in commercial pork production (1985-1986)

SAUER, W.C.

Evaluation of the quality of canola meal as measured by the secretion of the pancreatic enzymes in pigs (1985-1986)

SAUER, W.C.

The contribution of microbial vitamin synthesis in the hindgut to the vitamin supply of the pig (1985-1986)

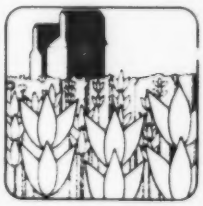
SHIRES, A.

Apparent and true metabolizable energy values of canola meals for chickens and turkeys (1985-1986)

FOOD SCIENCE

JELEN, P.

Ultrafiltration of cottage cheese whey for new dairy product use (1985-1986)



PLANT SCIENCE

TEWARI, J.P.

Colonization of barley in Alberta by the "biological fertilizers" (1985-1986)

WALTON, P.D.

Forage productivity from disturbed areas (1985-1986)

RURAL ECONOMY

CHASE-WILDE, L.J.

Analysis of import demand for malting barley in selected countries (1985-1986)

SOIL SCIENCE

CROWN, P.H.

Extraction of soil/crop information from digital radar data (1985-1986)

DUDAS, M.J., S. PAWLUK, T.B. GOH

Physical-chemical effects of nitrogen fertilizers on soils (1985-1986)

NYBORG, M.P.

A study of fall-applied nitrogen: timing of soil test for nitrogen, incorporation, and banding (1985-1986)

ROBERTSON, J.A.

Recovery of residual potassium from previous, high plowdown applications (1985-1986)

INTERDISCIPLINARY

YOUNG, B.A., J.J. LEONARD, J.B. McQUITTY, W.G. EVANS

Thermodynamics in overwintering bee colonies (1985-1986)

VETERINARY MEDICINE

MAPLETOFT, R.J.

Active immunization against GnRH as a replacement for surgical castration in beef cattle (1985-1986)

AGRICULTURAL ENGINEERING

DOMIER, K.W.

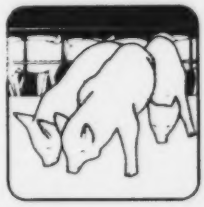
Metering and placement of urea super granules

Nitrogen fertilizer, primarily urea, is the dominant fertilizer in Alberta. The use of large Super Granules of urea (1, 2 and 3 gram sizes) manufactured by Norsk Hydro have been shown by Dr. S. Mahli of Agriculture Canada, Lacombe, and Dr. M. Nyborg, Soil Science Department, University of Alberta, to greatly reduce the losses associated with the use of granular urea. A logical extension of their work is a study of the engineering aspects of metering and placement of these large granules. The information derived from this study will be of benefit to manufacturers of seed drills and fertilizer application equipment. For the farmer, the end result will be an increase in agricultural production and net worth.

LEONARD, J.J.

Design of high pressure air inlets for winter ventilation of animal housing

Conventional fan/inlet systems are unable to satisfy fundamental air trajectory and mixing criteria with low ventilation rates under winter conditions. The aim of this project is to design fan/inlet systems that will give satisfactory performance under the above conditions. Such systems would lead to improved animal health and performance.



ANIMAL SCIENCE

AHERNE, F.X.

Management of reproductive problems in swine herds

The objectives of this research are to determine of the influence of gilt age on the efficacy of exogenous estradiol-17 for induction of puberty, and the influence of preweaning progestagen therapy on the length and synchronisation of the remating interval and on subsequent litter size.

Sows should wean in excess of 20 pigs per year, but the current figure for Alberta is 14. Two areas associated with reduced performance are delayed onset of puberty and poor performance following weaning of the first litter. Whilst not advocating the liberal use of hormone preparations, we feel that the results of this work will allow a more rational use of hormones in improving the reproductive efficiency of gilts.

AHERNE, F.X.

Influence of feed level and body condition between weaning and mating on sow reproductive performance

The objectives of this study are to study the influence of lactation feed level on sow weight and backfat change patterns between farrowing and weaning; to study the effects of high or low levels of feed intake during the remating interval on the length of the interval, ovulation rate, conception rate and percentage embryo survival--the relationship between body condition at weaning and mating and subsequent reproductive performance will be investigated; and to study the endocrine status of sows on different lactation and post weaning nutritional regimens.

In order to formulate effective feeding and management programmes for lactating and weaned sows we must understand not only what the direct effects of such programmes are on sow performance but we must be able to explain how they influence the physiological and endocrinological functions of the sow.

AHERNE, F.X.

An evaluation of the nutritive value of full fat canola seed for young pigs

The objectives of this study are to determine the nutritive value of full fat canola seed for weaner pigs and to determine the economics of "jet sploding" canola seed and the optimum temperature of such a process. Low grade canola seed (5 to 30% of the canola crop) could be used as a high-energy, high-protein feed for swine and poultry if it was properly processed and we knew its feed value. Such data could be of great benefit to feed companies, swine producers and canola growers.

KENNELLY, J.J.

Effect of ammonia on the preservation and the nutritive value of high moisture barley

The overall objective of this project is to determine the effect of ammoniation on the preservation and the nutritive value of high moisture barley. In addition to establishing the efficacy of ammoniation as a preservative (a feature which would be particularly beneficial under adverse harvesting conditions as experienced in 1985) the specific objectives are to determine the influence of ammoniation on the digestibility of high moisture barley; to evaluate the extent to which the added nitrogen (ammonia) can be utilized by rumen microbes; and to determine if ammoniation increases rumen by-pass of barley protein.

KENNELLY, J.J.

Storage of high moisture grain

The purpose of this project is to evaluate the usefulness of large plastic bags for storing high moisture grain, and compare the effectiveness of a large plastic bag system of storing grain to the use of chemical preservatives such as ammonia and sulfur dioxide.

This proposal compliments our AART grant application entitled "Effect of ammonia on the preservation and the nutritive value of high moisture barley" which considers the utilization of the ammonia treated barley.

The grain harvesting and storage system in western Canada is dependent upon good weather during the fall for harvest. This causes direct losses in grain and grain quality and indirect financial losses due to the need to have drying equipment and oversized combines, reduced weed control effectiveness, etc. In addition to being dependent upon weather, our harvesting and storing system is not the most efficient; it has been shown that dry matter yields per acre can be increased by 7-20% by harvesting barley at 30% moisture rather than as dry barley. There is thus a real need in western Canada to develop a system for storing high moisture grain which can readily be adopted by farmers.

PRICE, M.A.

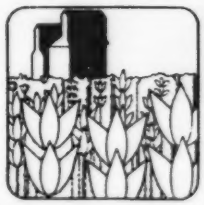
Studies of the effects of RALGRO on cow reproduction and growth of calves

The objective is to study the effects of RALGRO (a commonly used bovine growth promoter) on cow reproduction, mammary growth and lactation and growth of calves. RALGRO is an anabolic agent and so if implanted into a pregnant cow may depress fat deposition in the alveolar tissue of the mammary gland and stimulate functional alveolar growth. If so, this would increase milk production and hence have a significant effect in altering weaning weights of calves.

PRICE, M.A.

Seasonal changes in body composition of bison in the McKenzie Bison Sanctuary, Fort Providence, Northwest Territories

This study will form part of a program to develop the meat production potential of bison. The meat production capacity of land in the northern half of Alberta is unlikely to be tapped by the use of traditional species of livestock. The use of native species such as bison with their adaptation to the environment is, however, a way of capitalizing on the productivity of the environment without expensive inputs of capital and management.



PLANT SCIENCE

HIRUKI, C.

Improved diagnostic techniques for plant mycoplasma diseases by biotechnological approach

The objective of this project is to develop highly sensitive diagnostic techniques for plant mycoplasma diseases prevalent in Alberta with a particular emphasis on indirect immunofluorescence procedures. Mycoplasma-specific hybridoma cell lines will be established to ensure a continual supply of antibodies for the diagnostic services. Such highly sensitive and dependable technology will be very useful for eliminating potentially dangerous disease-source materials.

KING, J.R.

Seed production and soil seed populations under the Savory Grazing Method

The Savory Grazing Method is a short duration high intensity grazing system that is currently being adopted by a number of Albertan ranchers. Proponents of the system claim that it will allow stocking rates to be doubled, however, there is very little data available on the application of the system under Albertan conditions. One of the stated beneficial effects of the Savory Grazing Method is that it enhances plant succession towards more favourable and productive species. In order to investigate this claim, this project is designed to study the effect of the Savory Grazing Method when applied to native Alberta range, on seed production levels and the soil seed population (seed banking) and hence to identify possible changes in succession through seed reproduction.

VANDEN BORN, W.H.

Canola yield losses due to weeds

The objective of the research is to achieve an understanding of the competitive relationship between canola and volunteer barley, as a model system that is part of a canola-barley rotation. The information obtained will help canola producers know what weed densities result in yield loss, what weed emergence times are most serious, what weed removal times are most effective, what crop plant density is most competitive, and what differences in competitive ability exist among crop cultivars.

WALTON, P.D.

New species of grasses for Alberta

The botanical group which includes the grasses is a vast source of potentially valuable genetic variability which is largely unexplored. The native Canadian species from our prairies carry genes which confer resistance to local diseases and insect pests and enable the plants to withstand stresses caused by drought as well as high summer and low winter temperatures. In contrast our cultivated forage species (almost all of which have been introduced into Canada from Europe and Asia) give high yields of good quality forage and can withstand repeated defoliation. The object of this research proposal is to combine the favourable characteristics of the native and introduced species. New species of this type could be used in both native ranges and in cultivated pastures. There are twelve million acres of such land in western Canada alone. The overall production of forage material from that area is now valued at $360,000,000 per year. Thus an increase in forage yield of 5-10% would represent an annual increase in production valued at between $18 and $36 million. Where both productivity and survival have been improved such a yield increase would be a modest expectation indeed and would provide much needed assistance to the beef industry.

RURAL ECONOMY

HAWKINS, M.H.

Impact of lamb imports on the Alberta lamb industry

The objective of the research is to examine the impact of the import of New Zealand and U.S. lamb products on the production of lambs in Alberta.

There is a need for a comprehensive review of the lamb industry and its future role in Alberta agriculture.

Alberta, through Lambco, now slaughters in excess of 50% of the lambs slaughtered in Canada. Lamb marketings appear to be stabilizing and the industry is making a small, but increasing contribution to Alberta farm incomes.

LEROHL, M.L.

Influence of inspection, grading and market promotion on the demand for grain

Considerable work has been done on the supply side on market related issues for regulated Canadian farm products. Supply management in the dairy and poultry sector is a case in point. However, very little research has been conducted on the regulations directed at the processing and demand side of the market. This paucity of research information has become more apparent with the advent of proposals for cost recovery of food inspection and grading services. Information is thus required to study the demand characteristics of agri-food products to understand how inspection and grading, as well as advertising, influence consumer demand.

Each nation has a different set of health inspection and grading standards on agri-food products. Exporting products with domestic inspection only may limit export sales opportunity unless the inspection standards designate precise quality standards. Research is needed on the costs and benefits of providing inspection services on exported products, which also meet import and domestic grading standards on grain commodities.

PHILLIPS, W.E., T.W. MANNING

The production structure of the Alberta and Canadian farm sector: a frontier cost function analysis

The purpose of this study is to determine the effects of technology and scale on farm producers in Alberta and Canada over time. The study is intended to help answer the question of what role these two effects play in the ever changing structure of farm production in Alberta and Canada. Specifically, the study will seek to examine producer input and output changes, input substitution, input demand, technical change, scale effects and technical inefficiency. The results of this study should provide a more complete understanding of the nature and extent of farm production changes in Alberta and Canada. This information should be useful to policy makers concerned with the effects of technology and farm size on farmers, agribusiness, and the economy in general.

SOIL SCIENCE

NYBORG, M.

Effect of soil moisture on banding of nitrogen fertilizers

The purpose of this research is to quantitatively explain the efficiency of "deep band" placed N fertilizer versus broadcast-incorporated N fertilizer, using field plots with rain-shelters to control moisture. Root and fertilizer distributions will be measured to assess the degree of fertilizer "stranding" under various moisture regimes. A N-15 balance will be employed to estimate efficiencies, N distributions and provide estimates of N losses due to leaching, immobilization and denitrification. This project will generate useful information on fertilizer uptake efficiency and the effects of the interactions of moisture, placement, N losses and rooting patterns.

INTERDISCIPLINARY

ROBERTSON, J.A., K.W. DOMIER

Residual effects of previously applied P fertilizer on tilled and untilled soils

The objective is to assess the availability to plants of previously applied (residual) P fertilizers.

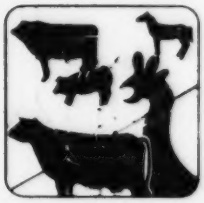
Since plants absorb only 20-25% of applied P in the year of application, and since there are essentially no losses of P from the soil, the level of soil P can increase over time. Some of the "residual" P remains available to plants, but the amount is not well established. Nor is it clear that the soil test can predict the availability. Residual P may permit farmers to reduce their annual applications, and it probably reduces the difference in effectiveness of various fertilizer placements.

GENETICS

HODGETTS, R.B.

Molecular basis of the response to selection for increased body weight

The objective of this experiment is to identify at least one of the major genes responsible for the increased 6 week body weight seen in a strain of mice obtained by selection at the Lacombe Research Laboratory. Identification of such genes in this model system will facilitate their isolation by recombinant DNA techniques and allow their reintroduction into normal sized animals to test whether they still exert an influence on growth rate in a different genetic background. This experiment, while conducted in mice, is the exact prototype of one which could be used to disseminate favourable genetic traits selected in agronomically important species such as swine, sheep and cattle.



VETERINARY MEDICINE

JANZEN, E.D.

*Field evaluation of the efficacy of a **H. somnus** bacterin*

In western Canadian feedlots, morbidity and mortality due to ITEME (Infectious Thromboembolic Meningoencephalitis) can result in a significant economic loss. Unfortunately, reliable control procedures are not available for this particular disease because the efficacy of the commercially available *Haemophilus somnus* (the causative agent) bacterins is highly controversial. The rationale for using the vaccine appears to be based on a single study where a seroconversion rate of 80.3% was obtained for cattle vaccinated twice. However, subsequent research indicates that there is a lack of correlation between serum antibody titres and susceptibility to ITEME infection. Thus, even on a theoretical basis it is impossible to make a recommendation regarding a vaccination strategy for ITEME. In addition, *Haemophilus somnus* has been implicated as a pathogen in the bovine respiratory disease complex. As a result, it has been suggested that vaccination with a *H. somnus* bacterin reduces morbidity due to bovine respiratory disease. Consequently, a large, well-designed field trial is required to obtain statistically valid information regarding the efficacy of *H. somnus* bacterins and to evaluate the hypothesis that *H. somnus* is significant in the pathogenesis of bovine respiratory disease.

The objective is to evaluate the efficacy of a commercially available *H. somnus* bacterin, and to determine if there is a correlation between *H. somnus* vaccination status and incidence of bovine respiratory disease.

JANZEN, E.D.

Investigation of a skeletal deformity syndrome in the fetuses of beef cows overwintered on silage

Skeletal birth deformities in calves are occurring with increasing incidence in western Canadian beef herds, a situation which threatens to escalate with the increased use of silage as a sole overwinter feed. Affected herds can have 20 to 50% of their calves born with dwarfism and deformed legs, resulting in significant economic losses to cow/calf producers in British Columbia, Alberta and Saskatchewan. This is the first controlled study designed to confirm or reject our epidemiological evidence that the deformities are due to a nutritional deficiency in silage fed overwinter. The study will also attempt to identify the possible nutritional factors involved so a rationale for prevention can be developed.

MAPLETOFT, R.J.

Embryo transfer in the cow: effect of cooling embryos to refrigerator temperature prior to freezing

The objectives of the research are to improve overall utilization of embryo freezing in the cow, and to determine the effect of cooling bovine embryos to +4°C prior to deep freezing on survival.

The successful utilization of embryo transfer in cattle breeding programs is dependent on maximizing results in order to reduce costs. Embryo freezing results have improved to the point that pregnancy rates are 15-20% lower than with fresh embryos. Further, embryos must be frozen within 6 hours of collection or survival drops considerably. However, embryos are often collected in the field and cannot be frozen for more than 6 hours. Refrigerated cooling may slow metabolism sufficiently during this time that freezing survival will improve. Preliminary results in our lab suggest this will be the case. Improved freezing results will reduce costs and increase its utilization in the future.

NAYLOR, J.M.

Comparison of bicarbonate and non-bicarbonate oral electrolyte solutions in preventing the development of depression and acidosis in scouring calves

The objective of this research is to determine if oral electrolyte solutions containing bicarbonate are more effective than non-bicarbonate solutions in *preventing* the development of acidosis and depression in scouring calves.

Diarrhea is a common problem in calves in western Canada; 17% of calves scour and about a tenth of these die. Vaccination against viral scours is ineffective and treatment remains an important method for reducing economic loss. Oral electrolyte solutions are widely used in treatment but there are wide variations in formulation. We have shown that only a few are capable of correcting acidosis and that the treatment of depressed scouring calves is more successful with bicarbonate containing fluids. Treatment is not as successful with non-bicarbonate fluids. Calves with viral scours often have a profuse diarrhea for several days before becoming acidotic and depressed; oral fluids are often given at this early stage before the calf becomes severely sick. We would like to know if bicarbonate based fluids are required to *prevent* acidosis and depression developing in scouring calves.

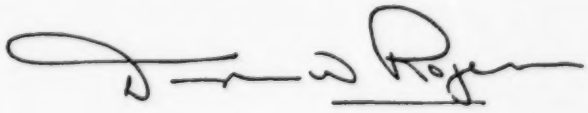
ALBERTA AGRICULTURAL RESEARCH TRUST
FINANCIAL STATEMENTS
MARCH 31, 1987

AUDITOR'S REPORT

To the Members of the Board of the
Alberta Agricultural Research Institute

I have examined the balance sheet of the Alberta Agricultural Research Trust as at March 31, 1987 and the statement of revenue, expenditure and unexpended funds for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Trust as at March 31, 1987 and the results of its operations and the changes in its financial position for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.



C.A.
Auditor General

Edmonton, Alberta
September 12, 1987

ALBERTA AGRICULTURAL RESEARCH TRUST
BALANCE SHEET
AS AT MARCH 31, 1987

	1987	*1986*
ASSETS		
Current:		
Cash	$217,897	$355,023
Research grants recoverable	—	5,000
	$217,897	$360,023
LIABILITIES AND UNEXPENDED FUNDS		
Current:		
Research grants payable	$193,830	$145,412
Administration charges payable	9,644	8,293
Unexpended funds	14,423	206,318
	$217,897	$360,023

The accompanying notes are part of these financial statements.

ALBERTA AGRICULTURAL RESEARCH TRUST
STATEMENT OF REVENUE, EXPENDITURE AND UNEXPENDED FUNDS
FOR THE YEAR ENDED MARCH 31, 1987

	1987	*1986*
REVENUE		
Contributions from the Province of Alberta, Department of Agriculture	$250,000	$250,000
Contributions from industry (Note 3)	182,269	180,906
Interest	37,918	38,453
	470,187	469,359
EXPENDITURE		
Research grants	$630,834	$447,192
Administration charge	31,248	38,022
	662,082	485,214
Excess of expenditure over revenue	191,895	15,855
Unexpended funds at beginning of year	206,318	222,173
Unexpended funds at end of year	$ 14,423	$206,318

Note 1 Authority

The Alberta Agricultural Research Trust operated under the authority of the Alberta Agricultural Research Trust Act, Chapter A-14, Revised Statutes of Alberta 1980, as amended. The Alberta Agricultural Research Institute Act, which came into force on July 15, 1987, repealed the Alberta Agricultural Research Trust Act. Liabilities and property of the Trust existing at that date became liabilities and property of the Alberta Agricultural Research Institute.

Note 2 Significant Accounting Policies

Research Grants

Research grants are recorded in these financial statements when approved for payment to researchers accounts. Unexpended balances of grant funds held in researchers accounts are not reflected in these financial statements.

Changes in Financial Position

A statement of changes in financial position is not provided as disclosure in these financial statements is considered to be adequate.

Note 3 Contributions from Industry

Contributions from industry represent only cash donations to the Trust for specific research projects and have been paid out of the Trust as research grants expenditure of the year.

Note 4 Approval of Financial Statements

These financial statements were approved by management.